

The Pioneers of Aerospace Medicine and What They Mean to Us

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There are many heroes in Aerospace Medicine, names you recognize during our Annual Scientific Meeting keynote lectures, at Honors Night every year where many of you have received awards named after historical figures in our field, and in a few presentations each year on the history of aviation or space medicine. As we near Memorial Day, I thought you might enjoy hearing about some of those who have preceded us and why they were important. Some you will know; others may be new to you. A hallmark of professionalism is acknowledging and honoring the pioneers who shaped our field.

You are likely familiar with the Montgolfier brothers, who in 1783 began studying the effects of hypoxia in animals and then in themselves using balloons, though you probably did not know that Edward Jenner, the first physician to demonstrate the benefits of vaccination with the cowpox virus to prevent smallpox, also launched two hydrogen-filled balloons in 1784, demonstrating an early interest in aviation. Two French aeronauts were the first to die of altitude hypoxia in 1875 when their balloon, *Zénith*, reached an altitude over 28,000 ft, despite having unpressurized bags of oxygen with them. Paul Bert, a French physiologist, investigated the effects of air pressure on plants, animals, and humans, including himself, in a pressure chamber which could simulate both hypobaric symptoms of high-altitude ascents, which could be alleviated by oxygen, and hyperbaric conditions which caused caisson disease, now known as decompression sickness. In 1878 he reported in his classic book *La Pression Barometrique*, that oxygen under pressure may be toxic, causing seizures in animals.

Kites and paper airplanes have been used for thousands of years, though there were no successful gliders until George

Cayley, the father of aeronautical engineering, invented and flew one in the early 1800s, and was the first to use a seatbelt to prevent him from falling out. Powered flight was made possible with the invention of the airplane by the Wright brothers, who demonstrated and sold Wright flyers nationally and internationally to individuals and the military. Aircraft were used in WWI, mostly for airborne surveillance. Medical standards for U.S. Army aviators were developed in 1911 by Dr. Ralph Greene, who was also the first Army medical officer to become a military aviator, and was later second President of the Aero Medical Association and Medical Director of Eastern Airlines. In France, the amazing nurse and pilot Marie Marvingt introduced the concepts of air ambulances and aeromedical evacuation.

Brigadier General Theodore Lyster served as the first Chief Surgeon of the U.S. Army Signal Corps. The following year a School of Aviation Medicine was established on Long Island, NY, with Col. William H. Wilmer commanding, and the term "flight surgeon" came into use. Major Louis H. Bauer succeeded Dr. Wilmer from 1919–1926, and worked with Dr. Raymond F. Longacre, who developed personality criteria for screening and selecting candidates for flight training. In 1939, Rear Admiral John C. Adams established the Aviation Medicine Research Unit in Pensacola, FL, later known as the Naval Aerospace Medical Research Laboratory (NAMRL) and, in 1946, the Naval School of Aviation Medicine. Commander Eric Liljencrantz was slated to serve as the director of the Research Unit but was unfortunately killed in an aviation accident in 1942 while conducting acceleration research. Dr. Walter Goldenrath was a physician aviator and physiologist who conducted research in Pensacola on explosive decompression and high G-forces in pilots, developing the Navy's first pressure suit, which was subsequently used in NASA's Mercury Program.

In 1929, Dr. Bauer was appointed as the first medical director of the Aeronautics Branch of the Department of Commerce, which later became the Federal Aviation Administration. He founded the Aerial Medical Association in 1929, which became the Aero Medical Association weeks later. He was elected as the first President and, in 1930, he established the *Journal of Aviation Medicine*. Meanwhile, the airline industry was developing with



Paul Bert



Louis H. Bauer

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Eugen Reinartz



Harry G. Armstrong

the Ford Trimotor, which could carry 8–9 passengers, and the Boeing Model 80, capable of carrying 18 passengers. The company started by William Boeing to manufacture aircraft also founded one of the first airlines, Boeing Air Transport, which joined three other small airlines in 1931 to become United Airlines. The Medical Director was Dr. John Tamisiea. In 1930 a nurse who was also a trained pilot, Ellen Church, became the first flight attendant. She suggested the position after Boeing refused to hire her as a pilot, and seven other young nurses were subsequently hired to join her. Other airlines also hired medical directors, several of whom, including Dr. Arnold Tuttle of United, Dr. Hodges McKnight of American, and Dr. Jan Tillisch of Northwest Airlines, established the Airlines Medical Directors Association in 1944, now known as the International Airline Medical Association.

The School of Aviation Medicine was established at Brooks Field, TX, in 1926 and 10 years later moved to Randolph Field, which was 20 miles away. It moved back to Brooks in 1957. The Commandant of the School from 1941–1946 was Brigadier General Eugen Reinartz, who had a long and distinguished career in aviation medicine starting in WWI. In 1942 he established a new Research Department with Major General Harry G. Armstrong as the first Director. Armstrong graduated from the School of

Aviation Medicine at Brooks Field in 1930 and, during his career, developed the first U.S. centrifuge to investigate G-forces, created medical criteria for pressurized aircraft, designed shoulder-strap seatbelts and crash helmets, and discovered that blood boils at 63,000 ft altitude (now known as the “Armstrong Line”). He published *Principles and Practices of Aviation Medicine* (now *Fundamentals of Aerospace Medicine*) in 1939. He established the Department of Space Medicine 10 years later, and in 1954 he became Surgeon General of the U.S. Air Forces in Europe, helping European nations build their aviation medicine programs.

Aviation Medicine physicians who advanced our field in the 1940s and beyond were Canadians Dr. Wilbur Franks and Nobel Laureate Dr. Frederick Banting (of insulin fame) who developed the water-filled G suit, which they tested in a high-speed centrifuge they designed and built. Several Mayo Clinic physicians, Drs. Boothby, Lovelace, and Bulbulian developed the BLB mask, initially for passengers before aircraft pressurization, modified in WWII for high altitude flying by military pilots, and Drs. Earl Wood, Charlie Code (another Canadian), and Edward Lambert, who built a centrifuge and developed the M-1 maneuver and, working with the David Clark Company, the modern air-filled G-suit. In the late 1940s and 1950s, General Paul Stapp studied the effects of rapid acceleration and deceleration on pilots, reaching 632 mph on a track in a 1954 experiment.

As we prepare for the 100th Anniversary of the Aerospace Medical Association in 5 years, we have many things to celebrate, starting with these and other contributors to our profession of aerospace medicine. Many of them served in the military. In the United States we will soon be observing Memorial Day. Memorial Day originated as a commemoration of Union soldiers who had died in the Civil War and over time evolved as a day to honor and remember military personnel who have died while serving, or after having served, in all conflicts. For all who have lost family, friends, and colleagues in military service, may you find peace and comfort in the cherished memories of your loved ones, and may their bravery and sacrifice continue to inspire us all.

AsMA is a family. No one belongs here more than you!